DOCUMENT RESUME

ED 315 824 CS 507 064

AUTHOR Burke, Julie A.; And Others
TITLE Activating Interpersonal Influence in Health Promotion: A Field Test of Iowa's Program Against Smoking.
SPONS AGENCY National Institutes of Health (DHHS), Bethesda, Md.
PUB DATE Nov 89
GRANT RI8-HL32847
NOTE 39p.; Paper presented at the Annual Meeting of the Speech Communication Association (75th, San Francisco, CA, November 18-21, 1989).
PUB TYPE Reports - Evaluative/Feasibility (142) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Adolescents; Analysis of Variance; Communication Research; Grade 7; *Health Programs; Interpersonal Communication; Intervention; Junior High Schools; Middle Schools; Path Analysis; *Peer Influence; Peer Relationship; Physical Health; *Smoking; *Social Values
IDENTIFIERS Health Communication; *Health Motivation; *Iowa

ABSTRACT

This study examined a smoking intervention program, which employed group competitions with rewards, to determine its effects on adolescents' smoking-relevant beliefs, their subjective norms, and peer influence. Initially, 1,187 seventh graders in Burlington, Clinton, and Muscatine, Iowa were surveyed in 1984. Data were gathered from a re-survey administered to 964 of these seventh graders attending seven middle schools in 1986. Two communities participated in a smoking prevention curriculum as well as in a knowledge competition and a nonsmoking competition while students in the third community received only the educational unit. Results revealed that the effects of the intervention on self-reported smoking interacted with the amount adolescents had smoked prior to the intervention. Those who had never smoked and occasional smokers who participated in the competition reported smoking less frequently than those in the control group. The opposite was found for adolescents who were already weekly smokers before the intervention; weekly smokers who were in the competition increased their frequency of smoking more than those who were not and had higher salivary thiocyanate levels. When self-described smoking was the dependent variable, this boomerang effect was found for girls but not for boys. Results also indicated that the competition affected subjects' beliefs about the bad effects and short-term good effects of smoking, as well as their perceptions of their friends' attitudes toward smoking, and these, in turn, affected smoking behavior. (Six tables and two figures of data are included; 39 references are attached.) (KEH)

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Julie A. Burke
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED315824

ACTIVATING INTERPERSONAL INFLUENCE IN HEALTH PROMOTION: A FIELD TEST OF IOWA'S PROGRAM AGAINST SMOKING

Julie A. Burke
University of Oregon

Abran Salazar
Virginia Daugherty
and
Samuel L. Becker
University of Iowa

Annual Meeting of the
Speech Communication Association
San Francisco, CA
November, 1989

Running Head: Iowa's Program Against Smoking

The work reported here was supported in part by grant RI8-HL32847 from the National Institutes of Health, National Heart, Lung, and Blood Institute. We wish to thank the students, parents, teachers, and administrators in Burlington, Clinton, and Muscatine. Without their cooperation and support this research would not have been possible.

CS507064

BEST COPY AVAILABLE

ACTIVATING INTERPERSONAL INFLUENCE IN HEALTH PROMOTION: A FIELD TEST OF IOWA'S PROGRAM AGAINST SMOKING

Abstract

A persuasive intervention was designed to affect adolescents' smoking-relevant beliefs and subjective norms, and thereby their behavior. It was also expected to influence smoking indirectly by altering the influence that adolescents exerted on one another. The intervention, employing group competitions with rewards, was field tested in seven middle schools in three Iowa communities. This paper reports its effects after more than one year.

Analyses of a panel of 964 students revealed that the effects of the intervention on self-reported smoking interacted with the amount adolescents had smoked prior to the intervention. Those never and occasional smokers who participated in the competition reported smoking less frequently than those in the control group. The opposite was found for adolescents who were already weekly smokers before the intervention; weekly smokers who were in the competition increased their frequency of smoking more than those who were not and had higher salivary thiocyanate levels. When self described smoking was the dependent variable, this boomerang effect was found for girls but not for boys.

Path analyses indicated that the effect of the competition on smoking was virtually all indirect. It affected subjects' beliefs about the bad effects and short-term good effects of smoking, as well as their perceptions of their friends' attitudes toward smoking, and these, in turn, affected smoking behavior.

Iowa's Program Against Smoking

Cigarette smoking is the single most important cause of preventable illness and early death (U.S. Department of Health and Human Services, 1983). Despite the well substantiated and well publicized deleterious effects of tobacco, almost a third of adults in the U.S. continue smoking. This statistic is attributable, in part, to the great difficulty many people have quitting, even when motivated to do so. The majority of smoking adults began experimenting with cigarettes in middle school and became regular smokers before completing high school. Given this pattern of initiation and the difficulty with cessation, strategies must be developed to persuade adolescents not to start smoking.

In the past 25 years, not surprisingly, most researchers have tried to influence adolescents with educational units delivered in schools. Early curricula emphasizing long-term health consequences were found to be relatively ineffective (Andrus, 1964; Beckerman, 1963; Flay, 1985; Irwin, Creswell, & Stauffer, 1970; Jeffreys & Westaway, 1961; Jones, Piper, & Matthews, 1970; Morrison, 1964; Piper, Jones, & Matthes, 1974; Thompson, 1978). Recent anti-smoking educational curricula based on social and psychological factors associated with the initiation and maintenance of smoking have achieved more success in persuading adolescents not to smoke (Botvin & Eng, 1980, 1982; Botvin, Eng, & Williams, 1980; Evans, Rozelle, Mittelmark, Hanesen, Bane, & Havis, 1978; Flay, Ryan, Best, et al, 1985; Hansen, Johnson, Flay, Graham, Sobel, n.d.; Hurd, Johnson, Pechacek, Best, Jacobs, & Luepker, 1980; Luepker, Johnson, Murray, & Pechacek; 1983; McAlister, Perry & Maccoby, 1979; Perry, Killen, Telch, Slinkard, & Danaher,

1980; Schinke, Gilchrist, Schilling, & Senechal, 1986; Schinke, Gilchrist, & Snow, 1985; Telch, Killen, McAlister, Perry & Maccoby; 1982).

Even when exposed to such psychosocial prevention curricula, though, the number of adolescents smoking increases steadily and substantially between seventh grade and the end of high school. The need to improve the short- and long-term effectiveness of such curricula is apparent; finding effective means for doing so is the problem.

Fishbein and Ajzen's theory of reasoned action (Ajzen & Fishbein, 1977; Fishbein, 1979, 1982; Fishbein & Ajzen, 1975) suggests that preventing the initiation of a voluntary behavior, such as smoking, depends on altering smoking-relevant beliefs and/or subjective norms. Therefore a persuasive intervention capable of influencing these was sought.

Group competition with rewards was selected as a persuasive intervention with the potential to change beliefs and norms. We designed two competitions; one rewarded knowledge acquisition, the other rewarded nonsmoking. The knowledge competition was structured to enhance students' receptivity to the information presented in the educational curriculum by rewarding them for learning. We expected this to add new and alter their old smoking-relevant beliefs. We assumed that the usual sorts of school rewards--grades--were not useful in this case because the adolescents most motivated to smoke tend to be the ones who are least motivated by grades. Therefore, we supplied an alternative reward.

We rewarded the groups that learned the most, rather than the individual because we thought making rewards dependent on the success of a group would enhance the direct effect of the competition by activating interpersonal influence and increasing cooperation among classmates in learning the curriculum (Hansell, Tackaberry, & Slavin, 1981; Slavin, 1983; Slavin & Karweit, 1984; Slavin, Leavey, & Madden, 1984). Put another way, we wanted an intervention that would increase the likelihood that adolescents would influence their friends and classmates who might not otherwise be motivated to do so to learn material and skills presented in the educational curriculum. So the group competition was expected to affect beliefs and norms directly as well as indirectly by stimulating interpersonal influence.

We relied on similar reasoning in the development of a nonsmoking competition. We offered a nontraditional reward to influence smoking directly. We made receipt of the reward dependent on the performance of a group in order to increase interpersonal influence to produce the desired behavior. So both the knowledge and nonsmoking competitions were designed to directly influence beliefs, norms, and smoking. They were also designed to activate interpersonal influence in order to shape the influence exerted by adolescents on their peers' beliefs, norms, and smoking.

These competitions had several short-term effects (Burke, Naughton, Becker, Arbogast, Lauer, & Krohn, 1987). Immediately following the interventions, adolescents who participated in the competitions were more concerned about their health and the health of their family and friends than adolescents in the curriculum only group. They were also

more likely to associate smoking with maturity and short-term bad effects. Occasional and weekly smokers' knowledge about smoking and its consequences were significantly increased by participating in the competition and their intentions to smoke were significantly reduced. No significant effect of competition on smoking behavior was observed however.

This paper examines the effects of these competitions one year later. It assesses the influence of competitions that occurred in 1984-85 on adolescents' beliefs, norms, and behavior over a year later in spring, 1986.

METHODS

Subjects

Surveys were administered in fall, 1984 to seventh graders attending public school in Burlington, Clinton, and Muscatine, Iowa. Of the 1187 seventh graders who completed surveys in fall, 1984, 964 were re-surveyed when in the eighth grade in spring, 1986. Surveys were administered by project staff during regularly scheduled class sessions. Like their home communities, most of the students are white (more than 90%) and from working or middle class families.

Persuasive Interventions

Educational Unit

In 1984-85 a six session educational unit designed to prevent smoking was implemented in health education classes by regular health teachers and trained peer leaders. It supplied information about the social and health consequences of smoking. It also provided skills training for resisting peer and media pressures to smoke.

Competition and Reward

Knowledge Competition. A knowledge competition among seventh grade health classes was held during the 1984-85 school year. In the spring of 1985 all students in the classroom at each school that had the greatest overall improvement between a knowledge pre- and post-test were rewarded with a T-shirt displaying the project logo.

Nonsmoking Competition. A nonsmoking competition was also held during the 1984-85 school year. The contest was staged between seventh grade students in two of the three communities. Students were told that those in the community with the lower smoking rate at the end of the year would be rewarded with a movie pass and free ice cream.

Study Design

During the 1984-85 school year, in addition to the smoking prevention curriculum, students in Clinton and Muscatine participated in the knowledge and nonsmoking competitions, while students in the control community, Burlington, received only the educational unit. The three communities are similar in size, ethnicity, average family income, rate of unemployment, and other characteristics.

Measures

Smoking Relevant Beliefs

We drew belief items from previous studies, from responses to open-ended questions concerning the consequences associated with smoking, and from the educational curriculum. A factor analysis using varimax rotation and maximum likelihood procedures was run to reduce the number of belief items in the fall questionnaire. Four factors with a

minimum eigenvalue of 1.0 were retained. A belief index was created for each factor by averaging the scores on items that loaded above .50 on that factor and below .35 on any other factor. The four belief index scores were computed from the spring 1986 data, as well as the fall 1984 data on which the factor analysis was done. Cronbach's alpha was used to assess the reliability of each belief index.

The bad effects index consisted of seven items measuring whether respondents believed smoking had negative consequences (such as coughing, bad smell, and shortened breath). Higher scores reflect the association of a larger number of negative consequences with smoking. Cronbach's alpha was .80 for the fall and .76 for the spring index.

The short-term favorable effects index measured whether respondents associated certain favorable consequences with smoking: enjoyment, feeling good, relaxation, and stimulation. Higher scores reflect the association of a larger number of favorable consequences with smoking. Cronbach's alpha for the fall and spring indices were .70 and .71, respectively.

The long-term health index measured subjects' agreement with two items (smoking is dangerous to health and smokers are more likely to die from heart disease) on six point scales anchored by strongly agree and strongly disagree. Higher scores reflect stronger agreement. Cronbach's alpha for the fall and spring index was .74 and .51, respectively.

The adult belief index also consisted of two items. Subjects indicated whether they believed smoking made them look sophisticated and grown-up and made them feel like an adult. Higher scores reflect

the association of more of these effects with smoking. Cronbach's alpha was .84 for the fall and .73 for the spring index.

Subjective Norms

In fall 1984, several family members' (i.e., mother's, father's, brother's, and sister's) attitude toward subjects' smoking were assessed with six point scales ranging from strongly encouraging to strongly discouraging. Scores on these items were averaged. Higher scores reflect more discouraging reactions from family members. Cronbach's alpha was .94. In spring, 1986 a single question asked subjects to indicate on a five point scale whether their families thought smoking was good or bad.

Friends' attitude toward smoking was measured with two items in fall 1984. Questions about best male and female friends' reactions to smoking by respondents provided six response options ranging from strongly encouraging to strongly discouraging. Higher scores reflect more discouraging reactions from best friends. Cronbach's alpha was .86. In spring, 1986 a single question asked subjects to indicate on a five point scale whether their best friends thought smoking was good or bad.

Smoking Behavior

Pre-intervention smoking was assessed with three questions. One item asked subjects to select the label that best described their smoking behavior. The five labels provided were non, ex-, light, moderate, or heavy smoker. Another asked subjects to indicate their frequency of smoking on a six point scale with response options ranging from "never" to "every day or nearly every day." The third

question asked subjects to report quantity smoked on a six point scale with options ranging from "do not smoke at all" to "20 or more cigarettes per day." The reliability of these questions was assessed, in part, with Pearson product moment correlations; the correlations between the smoking self-report questions ranged from .79 to .85.

Post-intervention smoking was assessed with two questions. The self description question was repeated. The original frequency/quantity questions were combined into one question with 10 response options ranging from "never" to "more than half a pack per day." The correlation between these two questions was .86.

Saliva samples were also collected when surveys were administered. They were analyzed for salivary thiocyanate to validate self-reported smoking. An explanation of this procedure for validating self reports is described elsewhere (Akers, Massey, Clark, & Lauer, 1983). Significant differences among mean levels of salivary thiocyanate for self-reported never, occasional, and weekly smokers in fall, 1984 enhanced confidence in adolescents' initial self reports. In spring 1986, the overall test for differences in average salivary thiocyanate levels of self-reported never, occasional, and weekly smokers' was also significant, although pairwise comparisons revealed no significant differences between the average salivary thiocyanate level of never (mean = 588) and occasional smokers (mean = 621).

ANALYSES AND RESULTS

Preliminary Analyses

Effects of Attribution

Only 964 of the original 1187 were surveyed in spring 1986. Because this loss of subjects might threaten the internal validity of the study, two preliminary analyses were run to assess the effect of special attrition. We first examined differential loss of subjects from the treatment and control groups. A chi-square revealed a significant relationship between attrition (study remainers vs. study dropout) and intervention (competition vs. control; chi square = 5.89, $df = 1$, $p < .02$). More subjects were lost in the control (22.6%) than the treatment condition (16.7%).

We also assessed internal validity with 2 (control vs. competition) x 2 (study remainer vs. study dropout) analyses of variance. Because our cell frequencies for these analyses, and later three-way analyses of covariance, did not fully meet the proportionality assumption for such analyses, we considered unweighted means analysis of variance and covariance. However, that would have reduced generalizability of results because it would have, in effect, assumed a population with equal numbers of seventh grade never, occasional, and weekly smokers, whereas in fact, there are roughly 10 times as many never as weekly smokers in the seventh grade. In addition, proportionality was approximated sufficiently, as Table 1 (from the first analysis of covariance) exemplifies, to allow us to assume that lack of perfect proportionality would have no important effect on results. Therefore, analyses of variance and covariance for balanced designs were used.

[INSERT TABLE 1 ABOUT HERE]

In assessing internal validity, we ran separate analyses for each of the tree smoking self-report items and the biochemical measure of

smoking. A significant interaction would indicate that the difference in smoking between subjects who dropped out of the study and those who remained (i.e., those for whom data were available from both the 1984 and the 1986 surveys) was not the same for the competition and control groups. No significant interaction was found for self-reported frequency of cigarettes smoked, self described smoking, or level of salivary thiocyanate. A significant interaction was found for one self-report item, quantity of cigarettes smoked ($F = 4.41$, $df = 1,1183$, $p < .05$). Study dropouts (mean = 1.35) and remainers (mean = 1.30) in the control conditions differed little from the remainers (mean = 1.31) in the competition condition, but the study dropouts (mean = 1.73) from the competition condition had a significantly higher mean. Because a significant interaction was found on only one of the four pre-intervention measures of smoking, we concluded that the validity of the study was not jeopardized by differential dropout rates.

An Assessment of Pre-Intervention Differences

To determine whether subjects in the competition and control conditions differed from one another prior to intervention, we used one-way analysis of variance. We compared the two groups on the following variables: the four smoking belief indices, the two subjective norm indices, the three measures of self-reported smoking, and the biochemical assessment of smoking. No significant pre-intervention differences were found between subjects in the competition and control conditions on any of these variables.

The Influence of Smoking-relevant Beliefs and Norms on Behavior

We are interested in beliefs and subjective norms to the extent that they are related to behavior. So before reporting the effects of the persuasive intervention on beliefs, subjective norms, and behavior, we report the results of regression analyses assessing the relative influence of beliefs and subjective norms on concurrent smoking. We first regressed self-reported smoking in fall 1984 and spring 1986 on the four concurrent belief indices, then on the two concurrent subjective norm measures, and finally on all concurrent belief and normative measures together. (Pairwise deletion was used for all regression analyses in the study.) We report only the results for the regression analyses in which all concurrent measures were entered simultaneously (Table 2) because the pattern of results was similar to that observed when beliefs and subjective norms were entered separately.

[INSERT BALE 2 ABOUT HERE]

Fall, 1984

Only the bad effects index, short-term favorable effects index, and adolescents' perceptions of their friends attitude toward smoking accounted for a significant portion of the variance in the two fall self-report smoking measures (see Table 2). Friends' attitudes toward smoking accounted for somewhat more of the variance in self-descriptions than the two belief indices did. For smoking frequency, the three measures each accounted for roughly the same amount of variance.

Spring, 1986

In spring 1986 the bad effects and the short-term favorable effects indicators accounted for more of the variance in both dependent variables than friends' attitudes did (see Table 2). This time, family's attitude toward smoking was also a significant predictor of both smoking frequency and self description although not as important as friends' attitudes. Also interesting is the fact that these independent variables accounted for roughly twice as much variance in spring 1986 as they did in the fall of 1984.

Effects of Competition Interventions

To assess the effect of the competition interventions on smoking-relevant beliefs and subjective norms, we used analysis of covariance with three independent variables: initial smoking, sex, and intervention condition. Even though no significant pre-intervention differences were found, the fall measure corresponding to the dependent variable was used as a covariate in these analyses. In order to assess the effects of the intervention on smoking behavior, we used analysis of variance with initial smoking, sex,and intervention condition as independent variables.

Because adolescents' initial level of smoking has been found to moderate the effectiveness of smoking prevention interventions (Burke, Naughton, Becker, Arbogast, Lauer, & Krohn, 1987; Flay, d'Avernas, Best, Kersell, & Ryan, 1983), groups differing in pre-intervention smoking were created. Subjects in the panel were initially placed in one of three pre-intervention smoking groups: never, occasional, and weekly smokers based on their responses to the three questionnaire items. Subjects who reported on all three questions that they have

never smoked or who failed to answer one question, but reported never smoking on the other two were tentatively classified as never smokers (N=566). Subjects whose responses to the frequency and/or quantity questions were consistent with smoking less than once a week were classified as occasional smokers (N = 325). Subjects whose responses to the frequency and quantity questions were consistent with smoking at least once a week were classified as weekly smokers (N = 57). We were unable to classify 16 subjects because they provided inconsistent or incomplete answers.

After classifying subjects based on their self reports, we examined the salivary thiocyanate levels of never smokers. To identify never smokers who might be misclassified, we used the salivary thiocyanate level for nonsmokers employed by Luepker et al. (1983). This procedure reduced the number of "never smokers" to 506 and increased the number of occasional smokers to 364. The total N of the panel was reduced to 927 because we were unable to obtain thiocyanate scores for 21 subjects.

To determine the effects of potential misclassifications, we ran all analyses assessing the effectiveness of the intervention twice; once classifying only according to the self report groupings and a second time including self-reported "never smokers" who had thiocyanate levels above 1670 in the occasional smoking group (hereafter referred to as re-classified groupings). Wherever the results of these two analyses differed, we report both. Otherwise, we report only the results of the analyses run with the re-classified groupings.

The number of subjects included in each analysis varied because some subjects did not respond to all survey questions. Each analysis included the maximum number of subjects who provided complete data on the relevant variables. Where significant differences were found, the relevant means are reported.

Smoking-Relevant Beliefs

Bad Effects Belief Index. The competition intervention had a significant main effect on the number of bad effects adolescents associated with smoking ($F = 13.01$, $df = 1,861$, $p < .001$). Those in the competition associated more bad effects with smoking (mean = .85) than those in the control condition (mean = .79). The main effect for pre-intervention smoking status was also significant ($F = 15.96$, $df = 2,861$, $p < .001$), with means ranging from .88 for never smokers, to .79 for occasional smokers, and .62 for weekly smokers.

Short-term Favorable Effects Relief Index. When the number of short-term favorable effects associated with smoking was the dependent variable, the competition intervention was significant ($F = 7.76$, $df = 1,854$, $p < .01$), as was the interaction between sex and pre-intervention smoking ($F = 4.38$, $df = 2,854$, $p < .01$). Adolescents in the competition condition associated fewer short-term favorable effects with smoking (mean = .18) than adolescents not involved in competition (mean = .25). There was a positive relationship between frequency of smoking and the perception of favorable effects of smoking for both boys and girls (see Table 3). The interaction was due to the fact that the relationship was greater for girls than for boys; girls who were never smokers, girls who smoked occasionally were

somewhat more favorable than boys who smoked occasionally, whereas girls who were weekly smokers were substantially more favorable.

[INSERT TABLE 3 ABOUT HERE]

Adult Belief Index. None of the main effects or interactions were significant for the self-report groupings, but a significant sex by status interaction was found when reclassified groupings were used ($F = 3.98$, $df = 2,861$, $p < .05$). Boys who were never smokers perceived smoking and smokers as more mature than girls who were never smokers. This relationship was reversed for occasional and weekly smokers, with girls rating smoking as more mature. This sex difference was most pronounced for weekly smokers. This interaction is displayed in Table 3.

Long-term Health Belief Index. Only pre-intervention smoking had a significant effect on beliefs in the long-term negative health effects of smoking ($F = 3.84$, $df = 2,511$, $p < .05$). Never smokers were significantly more likely to associate smoking with negative long-term health effects than either occasional or weekly smokers (means = .91, .82, .83).

Subjective Norms

Family. Only pre-intervention smoking had a significant effect on perceptions of the degree to which one's family members disapproved of smoking ($F = 6.47$, $df = 2,264$, $p < .001$). Never smokers believed their families would be more disapproving (mean = 4.30) than occasional (mean = 3.91) or weekly (mean = 3.50) smokers.

Best Friends. All three independent variables had a significant effect on the degree to which subjects thought their best friends

disapproved of smoking: competition (F = 11.00, df = 1,547, p < .001); sex (F = 5.38, df = 1,547, p < .05); and pre-intervention smoking (F = 9.79, df = 2,547, p < .001). Those involved in competition thought their friends were more disapproving of smoking than those not involved (4.06 vs 3.78); boys believed their friends disapproved more than girls did (4.03 vs 3.89), and never smokers believed their friends disapproved most and weekly smokers believed their friends disapproved least, with occasional smokers roughly midway between (4.14, 3.81, 3.17).

Behavior

Self Described Smoking. The three way interaction (intervention condition by sex by pre-intervention smoking) was significant when self described smoking was the dependent variable (F = 5.36, df = 2,912, p < .01). An examination of the means (see Table 4) shows clearly what happened. For five of the six smoking status by sex conditions, the control subjects, on average, rated themselves as somewhat heavier smokers than the competition subjects. Both the degree to which subjects rated themselves as somewhat heavier smokers and the difference between competition and control groups increase steadily as one goes from the never smokers to the occasional smokers to the weekly smokers. The exception to that pattern is the group of girls who were weekly smokers at time 1. The break in the pattern there is due to the girls in the control condition who, on average, labelled themselves as relatively light smokers. The difference between occasional smokers and weekly smokers is almost identical for boys in both the competition and control conditions and girls in the

competition condition. However, there is virtually no difference between girls who are occasional and weekly smokers in the control condition. That break from the pattern is responsible for the three-way interaction.

[INSERT TABLE 4 ABOUT HERE]

Self-Reported Smoking Frequency. When self-reported smoking frequency was used as the dependent measure of smoking, a significant interaction between pre-intervention smoking status and intervention condition was found ($F = 5.12$, $df = 2,912$, $p < .01$). The means for the interaction, shown in Table 5, indicate that the interaction was due to a reversal of the pattern of differences at the level of weekly smokers. Competition had a small but consistent positive effect on adolescents who were originally never or occasional smokers, but a negative effect on those who were smoking at least once a week prior to the intervention. Unlike the situation with smoking self descriptions, the apparent boomerang effect of the competition on frequency of smoking was found for boys as well as girls.

[INSERT TABLE 5 ABOUT HERE]

Salivary Thiocyanate. When the biochemical measure of smoking was treated as a dependent variable, an interaction was found between pre-intervention smoking and intervention condition for the re-classified groupings ($F = 3.14$, $df = 2,853$, $p < .05$), but not for the self-reported groupings. Occasional smokers who participated in competition had significantly lower salivary thiocyanate levels than those in the control group, whereas differences were in the other direction for the other two groups (see Table 6). In addition, girls'

thiocyanate levels, on average, were significantly higher than boys (679 vs. 578); $F = 12.07$, $df = 1,853$, $p < .001$).

[INSERT TABLE 6 ABOUT HERE]

Path Model

Although all of these results are related to a single model of the way relevant competition might enhance the impact of a school-based anti-smoking curriculum on adolescents' smoking relevant beliefs, subjective norms, and behavior, it is difficult to grasp from the discursive description alone. To facilitate such comprehension, we have cast the bulk of the results into a path model (Figure 1), with self-reported smoking frequency as the dependent variable. (Models for self described smoking and salivary thiocyanate are almost identical with this one, except that they account for somewhat smaller portions of the variance.)

[INSERT FIGURE 1 ABOUT HERE]

One important finding illustrated by the path model is that most of the effects of sex, prior smoking, and the competition on smoking at time 2 are mediated through beliefs about the effects of smoking and perceptions of friends' and family's attitudes toward smoking. Of the three independent variables, only smoking at time 1 had a direct effect on smoking at time 2.

Consistent with the analyses of variance and covariance that were reported in the previous sections, competition did not have a direct effect on smoking at time 2, but did have an indirect effect through its effect on adolescents' perceptions of the degree to which their best friends thought smoking was bad, and their beliefs that smoking

is associated with bad effects and not associated with good effects. The indirect effect of competition on smoking at time 2 was .09.

Although meaningful, that influence is dwarfed by the effect of time 1 smoking on smoking at time 2. Time 1 smoking had a strong direct effect of .24 on smoking at time 2 and almost as great an indirect effect (.19), for a total effect of .43.

The entire model accounts for 51% of the variance in smoking at time 2. Not unexpectedly, it still leaves a great deal of the variance in time 2 smoking unexplained and even more of the variance in the mediating variables. These results are shown in the model by the residuals.

CONCLUSION

Before the intervention only beliefs about bad effects and short-term favorable effects of smoking and adolescents' perceptions of their friends' attitudes toward smoking were significant predictors of their concurrent smoking behavior. Beliefs about the long-term health consequences with smoking were not. Neither were beliefs associating smoking with the demonstration of maturity or perceptions of family's attitudes toward smoking.

After the persuasive intervention, short-term favorable and bad effects associated with smoking were significant predictors of concurrent smoking as were perceptions of family's and friends' attitudes toward smoking. Once again, beliefs that smoking has long-term health consequences and that it demonstrates maturity were not found to be significantly related to smoking.

These results suggest the need for targeting certain types of beliefs. Specifically, a persuasive intervention is likely to be more effective in altering adolescents' behavior if it: (1) reduces the number of short-term favorable effects they associate with smoking, and (2) increases and makes salient the number of bad effects such as that smoking shortens one's breath or makes one smell bad appear to have greater impact on adolescents' smoking than beliefs that smoking causes cancer or heart disease. Our intervention accomplished both of these goals; the competition intervention increased the number of bad effects and decreased the number of short-term good effects associated with smoking. These findings are consistent with those of Evans, Rozelle, Maxwell, Raines, Dill, Guthrie, Henderson, and Hill (1981) who also found that short-term physical consequences could be employed effectively in adolescent smoking prevention.

Our results suggest that changing some types of beliefs may not be as effective in preventing smoking. For example, even though adolescents believe that smoking is a means of demonstrating maturity (Murray & Perry, 1984), their smoking may not be reduced by challenging this perception because this belief does not predict their behavior. As indicated earlier, the same argument can be advanced with respect to beliefs concerning long-term health consequences such as cancer or heart disease. The reason beliefs in such long-term health consequences have so little relationship to behavior is probably that they are beyond the time perspective of adolescents (Mittlemark, 1984). Although the path analysis indicates that our intervention increased the number of long-term health consequences

associated with smoking, such beliefs were not found to be significant predictors of behavior in this study nor in another study comparing German and American adolescents (Semmer, Burke, Fuchs, Naughton, Dwyer, Lauer, & Lippert, 1989).

Although they were less important than salient beliefs, subjective norms were also found to be significant predictors of behavior. Our intervention was not designed to influence adolescents' perceptions of their family's attitudes toward smoking, but it was designed to increase interpersonal influence and hence was expected to influence their perceptions of their friends' attitudes. Only pre-intervention smoking had a significant effect on adolescents' perceptions of their family's attitudes toward smoking (the path analysis also showed a significant effect from competition, but the analysis of variance did not). However, all three independent variables significantly affected perceptions of best friends' attitudes: pre-intervention smoking was related to the perception of less negative attitudes, girls perceived their best friends as less negative toward smoking than boys, and most important, students in the competition perceived their best friends as more negative toward smoking than students in the control condition. Because a major rationale for the particular kinds of competitions used in this study was the assumption that they would increase peer pressure against smoking, these results provide critical support for the utility of the intervention.

Although the analyses of variance indicated that the persuasive intervention had a relatively direct effect on self-reported frequency of smoking and thiocyanate levels (interacting only with pre-

intervention level of smoking), the path analysis showed that the effect of competition was more complex than that. It indicated that the effect was almost completely indirect, the result of the competition's impact on beliefs about effects of smoking and friends' attitudes toward smoking.

Probably the most important finding from the analyses of variance is that competition may be counterproductive for adolescents who are already smoking at least once a week. If that finding replicates, some other means of motivating smoking reduction or cessation needs to be found for adolescents who are already smoking regularly. Except for that caveat, competition interventions of the sort used in this study appear to hold some promise for increasing the effectiveness of school-based smoking prevention efforts.

REFERENCES

Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. Psychological Bulletin, 84, 888-918.

Akers, R. L., Massey, J. L., Clarke, W., & Lauer, R. M. (1983). Are self-reports of adolescent deviance valid? Biochemical measures, randomized response, and the bogus pipeline in smoking behavior. Social Forces, 62, 234-251.

Andrus, L. H. (1964). Smoking by high school students: Failure of a campaign to persuade adolescents not to smoke. California Medicine, 101, 246-247.

Beckerman, S. C. (1963). Reportof an educational program regarding cigarette smoking among high school students. Journal of Maine Medical Association, 54, 60-63.

Botvin, G. J., & Eng, A. (1980). The efficacy of a multicomponent approach to the prevention program. Journal of School Health, 50, 209-213.

Botvin, G. J., Eng, A., & Williams, C. L. (1980). Preventing the onset of smoking through life skills training. Preventive Medicine, 9, 130-136.

Burke, J. A., Naughton, M., Becker, S. L., Arbogast, R., Lauer, R. M., & Krohn, M.D. (1987). The short-term effects of competition and rewards in an adolescent smoking prevention program. Health Education Quarterly, 14, 141-152.

Evans, R. I., Rozelle, R. M., Maxwell, S. E., Raines, B. E., Dill, C. A., Guthrie, T. J., Henderson, A. H., & Hill, P. C. (1981).

Social modeling films to deter smoking in adolescents: Results of a three-year field investigation. Journal of Applied Psychology, 66, 399-414.

Evans, R. I., Rozelle, R. M., Mittlemark, M. B., Hansen, W. B., Bane, A., & Havis, J. (1978). Deterring the onset of smoking in children: Knowledge of immediate physiological effects and coping with peer pressure, media pressure, and parent modeling. Journal of Applied Social Psychology, 8, 126-135.

Fishbein, M. (1979). A theory of reasoned action: Some applications and implications. In M. M. Page (Ed.), 1979 Nebraska symposium on motivation (pp. 65-116). Lincoln, Nebraska: University of Nebraska Press.

Fishbein, M. (1982). Social psychological analysis of smoking behavior. In R. T. Eiser (Ed.), Social psychology and behavioral medicine (pp. 179-197). NY: John Wiley & Sons LTD.

Fishbein, M., & Ajzen, I. (1975). Belief, attitude intention, and behavior: An introduction to theory and research. Boston: Addison-Wesley.

Flay, B. R. (1985). Adolescent smoking: Onset and prevention. Annals of Behavioral Medicine, 7, 9-13.

Flay, B. R. (1985b). Psychological approaches to smoking prevention: A review of findings. Health Psychology, 4, 449-488.

Flay, B. R., d'Avernas, J. R., Best, J. A., Kersell, M. W., & Ryan, K. B. (1983). Cigarette smoking: Why young people do it and ways of preventing it. In I. McGrath & P. Firestone (Eds.), Pediatric and

adolescent behavioral medicine (pp. 132-183). New York: Springer-Verlay.

Flay, B. R., Ryan, K. B., Best, J. A., Brown, K. S., Kersell, M. W., D'Avernas, J. R., & Zanna, M. P. (1985). Are social psychological smoking prevention programs effective? The Waterloo study. Journal of Behavioral Medicine, 8, 37-59.

Hansell, S., Tackaberry, S. N., & Slavin, R. E. (1981). Cooperation, competition, and the structure of student peer groups. Representative Research in Social Psychology, 12, 46-62.

Hansen, W. B., Johnson, C. A., Flay, B. R., Graham, J. W., & Sobel, J. (No date). Affective and social influences approaches to the prevention of multiple substance abuse among seventh grade students: Results from project smart. Unpublished manuscript University of Southern California.

Hurd, P. D., Johnson, C. A., Pechacek, T., Bast, L. P., Jacobs, D. R., Luepker, R. V. (1980). Prevention of cigarette smoking in seventh grade students. Journal of Behavioral Medicine, 3, 15-28.

Irwin, R. P., Creswell, W. H., & Stauffer, D. J. (1970). The effect of the teacher and three different classroom approaches on seventh grade students' knowledge, attitudes, and beliefs about smoking. Journal of School Health, 40, 355-359.

Jeffreys, M., & Westaway, W. R. (1961). Catch them before they start: A report on an attempt to influence childrens' smoking habits. Health Education Journal, 19, 3-17.

Jones, J. A., Piper, G. W., & Matthews, V. L. (1970). A student directed program in smoking education. Canadian Journal of Public Health, 61, 253-258.

Luepker, R. V., Johnson, C. A., Murray, D. M., & Pechacek, T. F. (1983). Prevention of cigarette smoking: Three-year follow-up of an education program for youth. Journal of Behavioral Medicine, 6, 53-62.

McAlister, A. L., Perry, C., & Maccoby, N. (1979). Adolescent smoking: Onset and prevention. Pediatrics, 63, 650-658.

Mittlemark, M. B. (1984). Progress and future directions in the prevention of smoking and related behaviors. In P. Lippert, A. McAlister, H. Hoffmeister (Eds.), Proceedings of the international workshop on health promotion in youth: Problems and perspectives (pp. 53-58). Berlin: Schriftenreihe des Institutes fur Sozialmedizin und Epidemiologie des Bundesgesundheitsamtes.

Morrison, J. B. (1964). Cigarette smoking: Surveys and a health education program in Winnipeg, Manitoba. Canadian Journal of Public Health, 55, 16-22.

Murray, D. M., & Perry, C. L. (1984). drug use. Paper presented at the 92nd annual meeting of the American Psychological Association, Toronto.

Perry, C., Killen, J., Telch, M., Slinkard, L. A., & Danaher, B. G. (1980). Modifying smoker behavior of teenagers: A school-based intervention. American Journal of Public Health, 70, 722-725.

Perry, C. H., Murray, D. M., & Klepp, K. (In press). Predictors of adolescent smoking and implications for prevention.

Piper, G. W., Jones, J. A., & Matthews, V. L. (1974). THe Saskatoon smoking project: Results of the second year. Canadian Journal of Public Health, 65, 127-129.

Schinke, S. P., Gilchrist, L. D., Schilling, II, R. F., Senechal, V. A. (1986). Smoking and smokeless tobacco use among adolescents: Trends and intervention results. Public Health Reports, 101, 373-378.

Schinke, S. P., Gilchrist, L. D., & Snow, W. H. (1985). Skills intervention to prevent cigarette smoking among adolescents. American Journal of Public Health, 75, 665-667.

Semmer, N. K., Burke, J. A., Fuchs, R., Naughton, M., Dwyer, J. H., Lauer, R. M., & Lippert, P. (1979). "Smoking makes be cough, calms me down, and makes me look older:" Beliefs as predictors of smoking in the Berlin-Bremen and Iowa Studies. Unpublished manuscript, University of Bern.

Slavin, R. E. (1983). When does cooperative learning increase student achievement? Psychological Bulletin, 94, 429-445.

Slavin, R. E., & Karweit, N. L. (1984). Mastery learning and student teams: A factorial experiment in urban general methematics classes. American Educational Research Journal, 21, 725-736.

Slavin, R. E., Leavey, M. B., & Madden, N. A. (1984). Combining cooperative learning and individualized instruction: Effects on student mathematics achievement, attitudes, and behavior.

Telch, M. J., Killen, J. D., McAlister, A. F., Perry, C. L., & Maccoby, N. (1982). Long-term follow-up of a pilot project on smoking

prevention with adolescents. Journal of Behavioral Medicine, 5, 1-8.

Thompson, L. L. (1978). Smoking education programs 1960-76. American Journal of Public Health, 68, 250-257.

U. S. Department of Health and Human Services. (1983). The health consequences of smoking: Cardiovascular disease. A report of the surgeon general. Rockville, MD.

Table 1

Table of Cell Ns for the First

Analysis of Covariance

Pre-intervention	Competition		Control	
Smoking Status:	Males	Females	Males	Females
Never	171	163	81	70
Occasional	117	105	64	56
Weekly	17	7	11	12

Table 2

Multiple Correlation and Standardized Beta Weights for Predicting Self-Reported Smoking with Concurrent Beliefs and Subjective Norms

	Smoking Frequency	Smoking Self Description
Fall, 1984		
Bad Effects Belief Index	-.19*	-.18*
Short-Term Favorable Effects	.19*	.18*
Long-Term Health Beliefs	-.06	.00
Adult Beliefs Index	-.07	-.08
Family's Attitude	-.11	-.12
Friends' Attitude	-.23*	-.38****
Multiple R	.50	.27
Multiple R Squared	.25	.21
Spring, 1986		
Bad Effects Belief Index	-.36****	-.38****
Short-Term Favorable Effects	.28****	.27****
Long-Term Health Beliefs	.04	.06*
Adult Beliefs Index	-.05*	-.03
Family's Attitude	-.09***	-.10**
Friends' Attitude	-.20****	-.18****
Multiple R	.67	.67
Multiple R Squared	.45	.46

* $p < .05$ *** $p < .001$

** $p < .01$ **** $p < .0001$

Table 3

Mean Belief Scores for Boys and Girls

Who Differed In Pre-Intervention Smoking

	Belief Index			
	Short-term		Adult	
Pre-Intervention	Favorable Effects		Beliefs	
Smoking Status:	Boys	Girls	Boys	Girls
Never	.19	.13	.17	.10
Occasional	.20	.25	.13	.17
Weekly	.38	.51	.16	.27

Table 4

Self-Described Smoking* in Two Conditions

by Boys and Girls Who Differed in Pre-intervention Smoking

Pre-intervention	Boys		Girls	
Smoking Status:	Competition	Control	Competition	Control
Never	1.19	1.17	1.20	1.33
Occasional	1.48	1.61	1.72	1.90
Weekly	2.65	3.07	3.00	2.00

*Scores ranged from 1 (non-smoker) to 5 (heavy smoker).

Table 5

Self-Reported Smoking Frequency* for Never, Occasional, and Weekly Smokers in Two Conditions

Pre-intervention	Condition	
Smoking status:	Competition	Control
Never	1.51	1.63
Occasional	2.67	2.92
Weekly	5.90	4.48

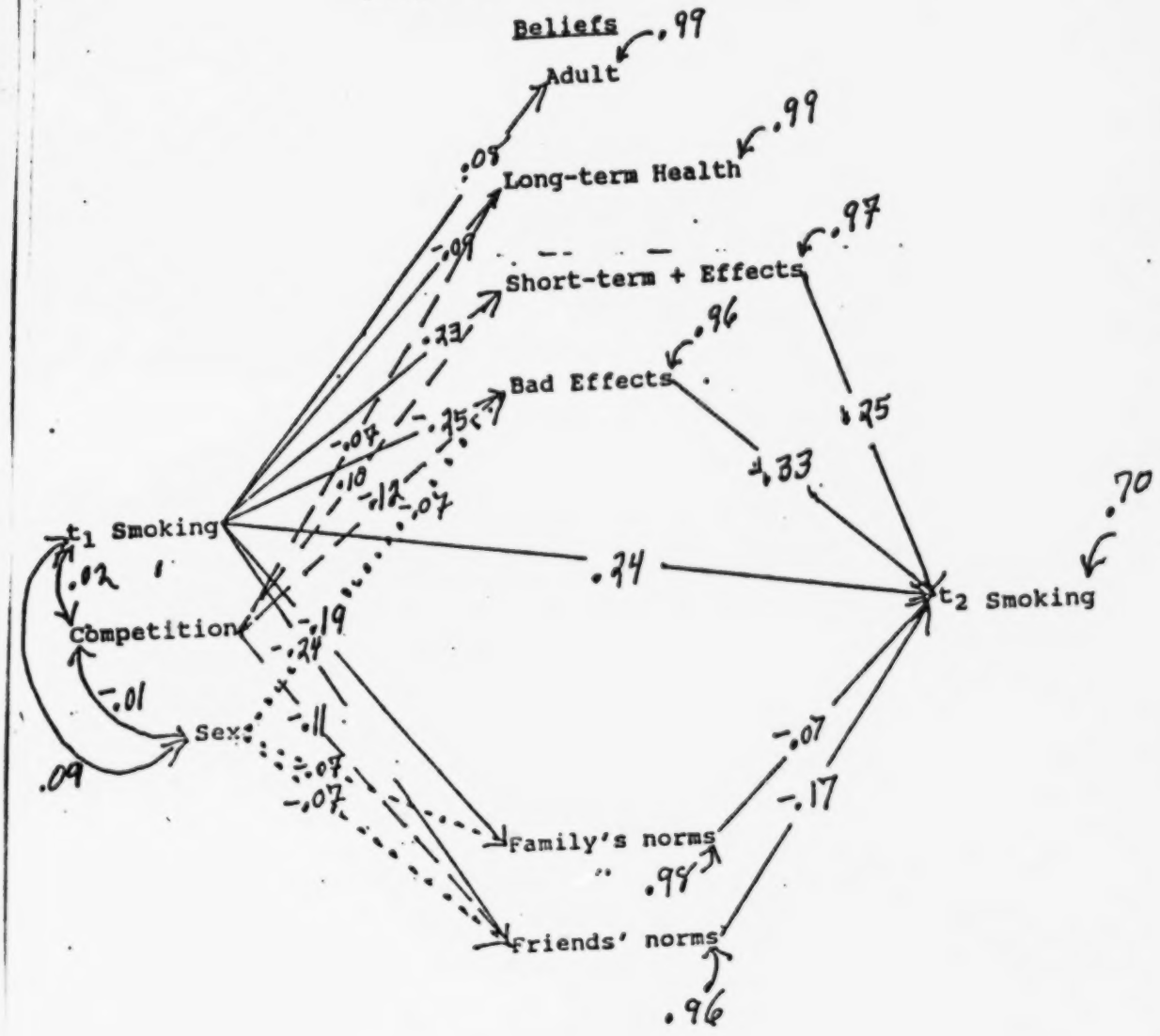
*Scores ranged from 1 (never) to 10 (more than half a pack per day.

Table 6

Salivary Thiocyanate Levels (μg) for Never, Occasional, and Weekly Smokers in Competition and Control Conditions

Pre-intervention Smoking status:	Condition: Competition	Control
Never	560	514
Occasional	634	760
Weekly	1120	977

Figure 1
Path Model of Influences on Smoking
(Only Significant Paths Shown)



Indirect effects on smoking frequency

Competition intervention	.09
Sex	.03
Pre-intervention smoking	.19

Regressions for Path Analysis
Beta Weights

	Maturity	Long term-	Short term+	Bad eff	Friends	Family	t_2 Smoking
Competition	.03	-.07	.10	-.12	-.11	-.05	-.03
t_1 Smoking	.08	-.09	.23	-.25	-.24	-.19	.24
Sex	-.01	.00	.02	-.07	-.07	-.07	.03
Maturity							-.05
Long term -							.03
Short term +							.25
Bad effects							-.33
Friends' norms							-.17
Family norms							-.07
R	.09	.11	.25	.28	.28	.20	.71
R^2	.01	.01	.06	.08	.07	.04	.51
Residual	.99	.99	.97	.96	.96	.98	.70